THE JOURNAL OF GEOGRAPHY

Vol. I MARCH, 1902 No. 3

THE USE OF MAPS IN THE TEACHING OF GEOGRAPHY*

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THERE are two stages in the use of maps in the teaching of Geography. The first consists in learning to understand the meaning of maps, the second in learning to apply the information so gained. It was long ago recognized that there are very considerable difficulties in teaching the meaning of a diagram to any one who has not learned how to use the symbols to represent ideas, and so, in order to render this task easier, maps prepared for school use have been made very "simple" in character; the typical indentations of a coast line have been straightened out in conventional curves, the intricate windings of a river system have been reduced to one main stream with a few tributaries on each bank giving little or no indication of the character of the country through which it flows; while the infinite variety of hill and dale, mountain and plain, which is at least suggested by a contoured map, has been caricatured by some caterpillar range of startling "simplicity." Maps showing the distribution of various phenomena such as means of communication, population, commerce, and even climate have been treated in the same way.

It is considered sufficient for showing means of communication to mark a few main commercial routes on a map with inaccurate rivers and with no reference to orographical features, with the

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result that the map does not even represent the state of development of a region or give any indication as to the character of the country by the presence or absence of railways, telegraphs, etc., in any particular part; again, population is treated on such broad lines that there is no possibility of establishing any connection between areas of dense and scanty population and physical features; products like rice or wheat, when shown on a map, are so broadly sketched in as to give no indication of the kind of country in which they flourish best; maps representing climate, such as temperature, pressure, winds and rainfall, are on such a small scale and so generalized as to become simply bold diagrammatic representations of broad scientific principles, but so elementary in character as to be of no value for the appreciation of the climate of any particular country; what, for instance, is the use of a small map of the world showing mean annual rainfall to a learner trying to understand the phenomena of the rains in India? The "simple" map has, of course, its uses, but it is merely a diagram representing in a graphic manner some point to be illustrated. Like a drawing on the blackboard it is valuable for teaching one point, but it is in no way sufficient, even for the first stage in the use of maps, as it contains very little beyond the immediate illustration that the student can read from it. This is so of necessity with a good diagram, since any attempt to show more than a few points spoils the effect, but a map should do much more than this. It is quite a mistake to suppose that detail in a map means loss of clearness. A contoured map with good shades of color is far more graphic than bold hill-shading, and it has the advantage of illustrating more than one idea. Like the country which it represents, the general notion of hill and valley is seen at the first glance; but like the actual landscape its details are not all learned at once, it is always there ready to throw light on some new fact or to suggest some new line of reasoning which would never occur on first acquaintance. It is a map to be lived with and not one merely to be used on show occasions. As an introduction to the meaning of a contoured map, the sheets of the ordnance survey of the district round the school should be in the hands of every teacher, who will find in them a perfect object lesson on the connection between map symbols and realities.

The second stage in the use of maps consists in their application, that is to say, in the connection of the points shown by one map with those shown by another, of orographical features with climate; the relation of both of these to means of communication,

vegetation, products, exploration and history. A wide and inexhaustible field lies before us, and, we fear, a heart-breaking prospect to any one who looks on Geography as a finite science that can be compressed into a statistical text-book and crammed intelligently or unintelligently for the purposes of examinations.

Fortunately, however, for the future of English education, the national importance of adequate teaching of Geography is becoming more and more widely recognized and, as a consequence, the statistical method is rapidly becoming a thing of the past. Examination papers are being set on more intelligent lines, teachers are given greater freedom, and an increasing wealth of material in the way of stimulating books, and above all of scientific maps is being placed at their disposal.

It is beginning to be recognized that isolated facts or even unapplied principles do not afford that training of the mind which Geography, properly treated, can give, and that the connection of one point with others, so far from confusing the mind, assists the understanding of the whole. To take an instance from history. If we try to describe Napoleon's march over the great St. Bernard without a map or with an inadequate map, surely all the niceties of the situation on which the campaign turned are completely lost; but, if we take a good contoured map, and show by a graphic appeal to the eye the narrow pass or broad valley, its crowning precipices or easy slopes, its branch exits or impenetrable monotony of mountain wall, its possibilities in fact for defence or attack, then at length the story gains life and vigor and color.

The interest in Geography is obviously increased if apparently unrelated facts can be connected together and the reasons for their connection made clear, but it is not yet fully realized that maps are almost indispensable for the work. As an illustration of this the history of the exploration of Australia is instructive. The early settlers at Port Jackson were confined to the narrow coast belt by the abrupt wooded cliffs of the Blue Mountains, and it was only after long and persistent efforts that a way was found on to the plateau beyond. With that may be contrasted the easy access from Brisbane to the Liverpool plains in the northern part of the dividing range, and again the almost impenetrable gorges and spurs of the more extreme northeast. With a contoured map before one, the whole history of the struggle from the seaboard to the interior becomes intelligible, and the more detailed the map the more clearly do the various routes stand out.

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To take another instance, Stuart, in his famous journey down to the mouth of the Murray, was to have been met there by a vessel. On reaching the river's mouth he was disappointed to find that even if the vessel had reached the spot, it would have been unable to enter Encounter Bay, on account of the prevalence of southwest winds. Moreover the rough sea and surf rendered it quite impossible for his boat to attempt to follow the coast. He was, therefore, obliged to retrace his steps, but this time up the river, where he endured untold privations and danger.

A careful examination of the wind charts for January and for July will very clearly show that exactly the same difficulties would attend a traveller of the present day, and this consideration suggests, if nothing else, a useful lesson on the permanence of natural causes.

The great obstacle to the exploration of the interior of Australia has been a lack of water, and it is only by consulting a rainfall map that the difficulties of McDowall Stuart's journey from south to north, along what is now the telegraph route, can be understood.

Again, without maps showing seasonal rainfall, it is impossible to reconcile the conflicting accounts of different explorers who found the same river at one season a dried-up channel, on another occasion a brackish stream, and on a third visit a fresh and full flowing river, or to understand how an expedition could be stopped by flooded marshes of reeds in a region where later on the obstacles to their progress were intense drought and desolation.

It is, of course, not possible to illustrate in this way all the details of exploration for want of the necessary maps, but the story always gains in clearness and reality where it is possible to obtain this help. What would not the early explorers have given for some of the scientific material with regard to climate and natural features that now lies at hand? What should we think of a navigator in the Antarctic who refused to avail himself of the accumulated experience of his predecessors? And yet, as a rule, we follow blindly the story of exploration at second hand, without being, as the early explorers at least were, in touch with realities, and we limit ourselves to their necessarily narrow horizon, because we have not thoroughly studied the physical features of the scene of action.

The training of the mind to appreciate the connection between the phenomena of nature is a most difficult part of education, but most important. It is only after long practice in the habit of intelligent reasoning that a student learns to look behind isolated facts

and search for the principles that connect them; hence, it is essential, from the beginning of Geography teaching, to suggest and work out problems which may help to stimulate thought. By careful arrangement a complicated relationship can be taken in stages, as a series of easy problems, each step being simplified in such a way as to suit the comprehension of the class. To give a few illustrations.

From a map without names showing elevation by shades of color, such as the Diagram Hand Map of the London District, to find the positions of the chief towns at the gaps of the North Downs.

From a similar map of France to find the possible lines of march of Cæsar.

From a similar map of India to show the regions of excessive rainfall.

From a similar map of South America to show the direction of the rain-bearing winds in the Amazon valley.

From maps of the Atlantic and Indian Oceans showing prevailing winds in January and July, to work out the winds likely to reach the land with an excess or deficiency of moisture, or to show the route of Columbus.

From maps of Africa showing rainfall in January and July to show the regions of permanent tropical forest, of savanna with an area extended or diminished according to rainfall, and of permanent desert.

From a series of maps showing climate and elevation to find the regions likely to produce rice.

From maps showing the density of population of Wales to find the coal mining districts.

From a map of Australia showing rail and telegraphs to show the area of densest population.

From a contoured map of the North Sea or the Banks near Newfoundland, to find the main fishing centres.

From a map showing the amount of Africa explored in 1788, consisting of a rim round the coast, to work out the special difficulties presented by the configuration of the land.

But we would go further; carefully selected series of typical views lend themselves to the problem method quite as readily as maps. It would be easy to multiply instances.

From two views of the northern and southern slopes of the Alps, to find the points of the compass from a consideration of the presence and absence of snow.

From a view, showing flat-roofed houses, or houses on piles, to infer the character of the rainfall.

From a picture of women carrying water in India, to infer the climate of the district in which the same was taken.

It is obvious that if maps are to be used for constant comparison and contrast a very much larger number will be required than are contained in the ordinary school atlas, and it may be thought that many of these suggestions merely represent a counsel of perfection, as the teacher cannot possibly obtain such maps. The difficulty, however, has been met by the "Diagram Company," which is now engaged in producing a systematic series of cheap and graphic lantern slides, consisting of maps and diagrams of all kinds needed to supplement the ordinary educational publications. The efforts of the Diagram Company to further the interests and enlarge the scope of geographical education have the warm approval of the Council of the Royal Geographical Society, and the coöperation of prominent members of the Geographical Association.

THE PECAN. ITS CULTURE AND COMMERCIAL VALUE

BY E. G. LITTLEJOHN, PRINCIPAL IN THE GALVESTON PUBLIC SCHOOLS.

NUT culture in the United States has received but very little attention until within recent years. The value of nuts as food has not been recognized, and their slow growth and bearing, together with the fact that it demands greater skill to produce superior nuts than is required in the culture of other fruits, have hindered their cultivation for profit.

In the countries of the old world the nut is highly prized. It fills the same place with the peasantry that Indian corn does with the common people in America. In France and Italy the chestnut forms almost the exclusive diet of the poorer classes during the fall and winter months. In Korea the chestnut is as universally used as is the potato in America. In southern Asia and adjacent islands the cocoanut is one of the most valuable products. It is said there

are 20,000,000 cocoanut trees in Ceylon alone, from which 800,000,000 nuts are obtained annually. The kola nut of Africa has been largely in use for centuries among the natives, who esteem it so highly that those who have no trees in their own territory will pay exorbitant prices for the nuts, either dry or in powdered form. The betel nut of India is used by more than 100,000,000 people, among whom betel chewing has become a habit as strong as tobacco chewing is among some other people.

North America has already contributed to the world's bill of fare two of the most highly esteemed articles of food —potatoes and Indian corn; and, as a third will probably give the most valuable nut, the *Carya olivæformis*, or pecan.

FIG. 1. LEAF AND FRUIT OF THE PECAN.

The pecan belongs to the great Juglans, or walnut family, and to the genus hickory, which is a native of western and central Asia as well as of America, and which contains our well-known walnut, sometimes called Persian walnut or Madeira nut.

The pecan is found native in the United States over an irregular area having near its four extremities the cities of Davenport, Iowa; Chattanooga, Tennessee; Laredo, Texas; and the northeastern boundary is very irregular, the growth extending much farther north along the tributaries of the Mississippi and Ohio rivers than on the adjoining uplands. The southeastern boundary is also irregular. From Chattanooga it follows the Tennessee river valley through northern Alabama, thence it skirts the easterly edge of the Mississippi river bottoms to Vicksburg. From Vicksburg to Laredo the

boundary is coincident with that of the coastal plain, which is seventy-five to one hundred miles in width. The western boundary is not definitely known. From the sources of the Colorado back to Davenport the line is comparatively direct.

While the tree is found native throughout this region, it attains its greatest perfection in the rich soil of alluvial plains, where it attains great size. The tree, when not crowded by other trees, often reaches a height of one hundred feet, with a diameter of four feet at the base and a spread of limbs of seventy feet. There is a tree on the Wabash river in Indiana with a girth of thirty feet at the ground and a height of fifty feet to the first limb. Mr. Robert Ridgeway, of the Smithsonian Institution, says: "The pecan is the largest of the hickories, and one of the largest trees of the forest. With the single exception of the white elm the pecan tree has the most widely expanded head of any tree in proportion to its size; while in altitude and majestic appearance the largest and finest elms are no comparison to it."

In general appearance the pecan very closely resembles the hickory; limbs and foliage are almost identical. The trunk is straight and slender, and at the age of ten years it is covered by the rough shaggy bark characteristic of the hickories. The leaves are compound with petioles twelve to eighteen inches long and with thirteen to fifteen sessile leaflets. The nut is olive-shaped, whence its specific name *olivæformis,* and is enclosed in an oblong four-angled green husk, which bursts open when the fruit is ripe. It has a thin, easily-broken, yellowish-brown shell surrounding the internal partitions of the hickory nut, and the kernel fills the entire shell. The meat possesses a delicate and pleasing flavor. The Louisiana pecan, which is said to be the finest and best, measures $1\frac{1}{2}$ to 2 inches in length by $\frac{3}{4}$ of an inch in diameter. Usually it takes eighty to one hundred nuts to weigh a pound; but occasionally a tree is found with large nuts which weigh forty to sixty to the pound.

The wood of the pecan tree is white, tough and durable, and is used largely in the manufacture of agricultural implements such as tool handles, wagon axletrees, etc.

Within the last two decades pecan culture has become an important industry. The largest orchards are found (census of 1890) in the states of Florida, Mississippi, Louisiana and Texas, Mississippi taking the lead with 12,520 acres under cultivation. The rapidity with which the industry has grown is shown by the fact that the non-bearing trees more than double the number of bearing trees

(census 1890). Mississippi has 28,970 bearing trees, 309,070 non-bearing; Florida 103,463 bearing, 125,373 non-bearing; Texas 23,635 bearing, 60,449 non-bearing. According to the census of 1890 the four states just mentioned produced a crop of 14,381,340 pounds of nuts valued at $1,599,116. The census of 1900 will without doubt show a very large increase over these figures.

The pecan comes into bearing at from seven to twelve years of age. Occasionally nuts are produced earlier, but not in paying quantities. A profitable crop can scarcely be expected under ten years. From this time the crop increases till the tree arrives at full

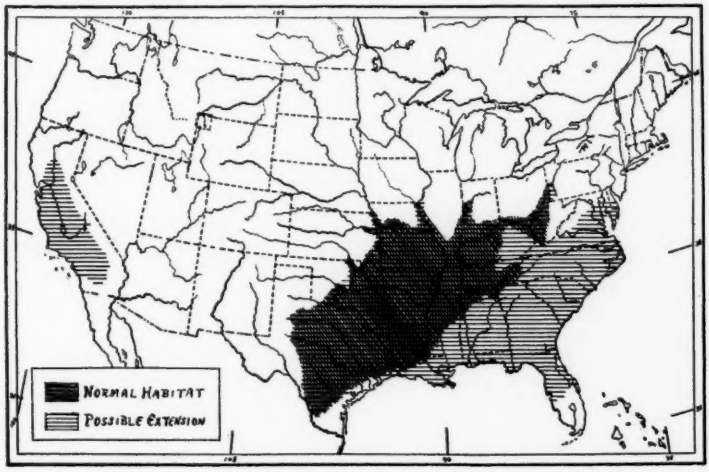

FIG. 2. AREAL DISTRIBUTION OF THE PECAN.

bearing at twenty, thirty or forty years of age. The tree is a rapid grower and reaches a height of from twenty to twenty-five feet in ten years.

The annual crop of a tree in full bearing is from one bushel to three barrels; the average being probably about one barrel, of 100 pounds. Colonel W. R. Stuart of Ocean Springs, Mississippi, the "Father of pecan culture," reports a tree which has produced more than one thousand pounds of nuts in a single season.

The tree flowers in May and the fruit ripens in October.

The growing importance of the pecan as a nut of commerce has called for more advanced methods in its cultivation and propaga-

tion. The earlier method followed nature's plan and planted the nut where the tree was to grow. It was soon found that trees propagated in this way could not be depended on to reproduce fruit of the same character and quality as the seed nut. In rare cases superior nuts have been produced from seedling trees, but the rule is degeneration. The sportive character of seedlings has caused other methods to be used, among which may be mentioned cuttings, layering, budding and grafting. The method of "annular budding" seems to have been most successful.

A deep sandy loam is the soil best suited to the pecan. The tree has a vigorous tap-root which it sends down to a depth of thirty feet, and on which its growth and productiveness largely depend; hence land with a compact clay subsoil or underlying rocks is unfit for pecan planting. The tree requires considerable moisture, but does not thrive where there is standing surface water. "The most rapid growth and earliest fruiting of ungrafted pecans have been on sandy land; the grandest trees and most prolific bearers have been on rich river bottoms."

There are some pecan growers who favor planting the nut in the orchard where the tree is expected to grow so that transplanting, which is a difficult and often unsuccessful operation, may be avoided. There are others, the majority perhaps, who propagate the tree in nurseries and claim this to be the most successful method. In the nursery method of propagation the nuts are bedded in boxes of sand and ashes sunk in the earth and there allowed to germinate. In the spring the sprouted nuts are taken from the beds and planted about eight inches apart in nursery rows. The rows should be four feet apart to allow cultivation with horse and plow. Thorough cultivation is now necessary. The ground must not be allowed to cake around the seedlings and all weeds and grass must be kept down. If the ground is poor, fertilizer of well-rotted stable manure, bone dust or cotton seed should be applied. The second season, usually in the month of June when the plant is sappy, the seedlings are budded or grafted. In the second or third year the young trees are transplanted to the orchard. The time for doing this is shortly after the leaves fall in November and December, or in the spring just before the buds begin to swell. The trees are set sixty feet apart each way, or twelve trees to the acre. Cultivation should be kept up till the trees come into bearing. The orchard may then be sown with grass and used as a pasture.

Harvesting begins as soon as the nuts ripen in the fall. Before

the market had been developed to any great extent the gathering was done principally by women and children, who visited the trees every morning and picked up the nuts that had fallen during the night. Some growers still adhere to this method, claiming that a better quality of nuts is obtained when all natural conditions have been fulfilled. Competition and the increased demand for the product have called for less tedious methods. So far machinery has not been employed; but a prominent Texas planter announces that he will use a street sweeper in his orchard. It remains to be seen whether or not his experiment will be a success. The method usually employed is to watch for the opening of the hulls, and then to climb the tree and shake the limbs or thresh them with long poles like fishing rods. As the nuts fall they are picked up into baskets. Some do not leave the hull and these are thrown into a pile and threshed out with flails.

FIG. 3. SHOWING THE RESULT OF TOP BUDDING.

The nuts are now prepared for market. They are first put into a revolving churn, where they are cleaned and polished. They are next assorted according to quality into three classes, those grown from selected stock for planting, those for confectionery and dessert uses and those suitable only for making oil. After being assorted they are put in barrels containing about one hundred pounds and shipped to all parts of the country. The price paid for the commercial article is from five to six cents per pound. For planting the more popular varieties sell at from fifty cents to one dollar and fifty cents per pound. San Antonio, Texas, is the most important centre of the trade.

The uses to which the wood of the pecan tree is put have already been mentioned. It is as a food that the nut is chiefly valuable, and for this purpose it is, in this country, rapidly displacing all other nuts. For digestibility it surpasses every other nut. It is rich in fats and possesses a high nutritive value. Converted into bread it is very nourishing and contributes in a high degree to the upbuilding of the muscular powers and vital energies. It is also made into butter which is scarcely distinguishable from that obtained from cow's milk. From it an oil is extracted that is suitable for table use; and the residuum forms an excellent food for all animals, surpassing, for this purpose, both linseed and cottonseed meal. It has an exten-

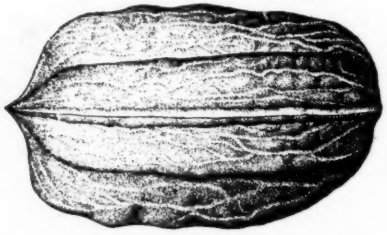

FIG. 4. THE McALLISTER, EXACT SIZE, (INDIANA).

FIG. 5. THE PEARL, EXACT SIZE, (TEXAS).

sive use in the confectionery trade. The pecan candy man, usually a Mexican, dressed in white duck jacket and trousers, is a familiar sight on the street corners of every Texas city. The nut is most widely known probably as a dessert, for no course dinner is complete without coffee and nuts, and the nuts may be procured ready shelled for table. The report on "Nut Culture in the United States," issued by the Department of Agriculture, says: "The pomological importance of the pecan is scarcely less than that of the Persian walnut or almond at the present time. With an area of special adaptation in the United States considerably larger than is found for either of the others, and with a susceptibility to improve-

ment by selection, in size of nut, thinness of shell, and delicacy of flavor that is very encouraging to those who have attempted this work, the pecan is probably destined to become the leading nut of the American market. If the culture is pushed with the usual skill and energy of American enterprise, there is reason to believe that it will not be many years before the pecan will become not only an abundant nut on our markets, but also an important article of export."

THE TRADE AND INDUSTRIES OF WESTERN SOUTH AMERICA

III

BY EMORY R. JOHNSON, PROFESSOR OF COMMERCE AND TRANSPORTATION IN THE UNIVERSITY OF PENNSYLVANIA.

THE Andean mountain system with its plateaus may be compared with the Rocky mountain region of the United States. Beginning in northern Colombia and reaching to the boundaries of Argentine and Chile, it has greater length than our Rocky mountain region, an equal or greater width, and probably more individual mountain ranges. In point of population, the Andean region exceeds its North American counterpart, for our seven Rocky mountain states and territories, not including the Pacific coast states, contained in 1900 only a million and a half of people, while the Andean region contains at least four millions. The industrial capacities of the people of the United States, it need hardly be mentioned, are far greater than those of the Andes.

The great elevation of the plateau situated in tropical latitudes gives it a variety of agricultural produce. On the intermediate heights beans, potatoes and wheat are grown, while in the hot valleys, which here and there intersect the plateau, the people raise sugar cane, oranges and bananas. There are single estates on which the owner grows all of the crops of both tropical and temperate climates.

The *Plateau* of *Ecuador* may be taken as a typical section of this Andean region. The Ecuadorean plateau has an elevation of 8,000

to 10,000 feet and is really an inclosed valley some 400 miles long and about 50 miles wide, hemmed in on both sides by the high chains of the Andes. The rainfall is scanty on the whole plateau, and agriculture usually depends upon irrigation, for which the snows of the mountain furnish abundant water. The soil is largely of volcanic origin, and is very fertile. The climate is mild and spring-like. The population is about 900,000.

This Ecuadorean population of nearly a million depends for its connection with the outside world upon a neglected and dangerous mule trail to Guayaquil. During the rainy season this precarious route sometimes becomes impassable and the interior is left entirely without means of communicating with the outside world. A railroad 350 miles in length is being built from Guayaquil to Quito, and the American company constructing it confidently expects that it will be completed long before the opening of the Isthmian canal.

With the coming of the railroad the people of interior Ecuador will use much larger quantities of imported manufactures than they have been able to get in the past, and they will want various kinds of machinery. They will secure the money to buy these things by working for the foreign capitalists engaged in developing the mines, by supplying the coast regions with food products, and by exporting hides and other agricultural commodities. The railroad will also enable them to secure the wood and lumber needed on the whole plateau region, which is in many places destitute of timber. The railroad will help in the introduction of modern industrial methods. The old wooden plough will gradually disappear; shovels and wheelbarrows will come into use; the people will thresh and clean their grain with machines instead of treading it out with animals and winnowing it in the wind. Their huts made of reeds or poles and put together without a bolt or a nail will gradually give way to houses, and in time the towns will be better built.

This description of the plateau of Ecuador would apply to many districts in Peru and Bolivia; the climate, people and industrial condition being very similar throughout the Andean plateau, the high parts of one country resemble those of another just as the plateaus of Colorado resemble those of Montana.

The plateau region reaches its greatest width near the boundaries of Peru and Bolivia, where such a state as Pennsylvania might easily be put down and be in every part at least 10,000 feet above the level of the sea. Lake Titicaca is as large as Connecticut and drains into Lake Poopo, which is as large as Rhode Island. These

lakes are connected by the Desoguardero river, 180 miles long and navigated a part of the way by steamers. These lakes are the centre of a great treeless plain chiefly devoted to stock raising. The Bolivian part of this plain supports about 7,000,000 sheep, a number one-sixth as great as all of those in the United States, and there are, in addition, many cattle, mules and swine. Barley and potatoes are grown, the surplus crops of the Indian agriculturalist being marketed in the mining towns.

The people of the Andean plateau are now very poor. They make their own clothes, raise their own food, receive low wages, have a low standard of living and buy but little from the outside world. But their needs and standards can and will change. On this point the experience of Mexico is interesting. Twenty years ago foreign merchants in the interior of Mexico despaired of the people ever becoming large consumers. Five-sixths of them were Indians, who received for their wages five cents per day in cash and five cents in rations. Communication was by stagecoach. The people wore sandals, unbleached cotton, and straw hats, and bought practically nothing. Since that time railroads have been built through these districts and the laborer is receiving from fifty cents to a dollar and a half a day as an agricultural or mining laborer, and every Indian wants a watch. With their higher wages they have become good buyers of manufactures from their own and foreign countries. The Andean plateau offers conditions to-day similar to those of interior Mexico twenty years ago and there is reason to believe that what has happened in Mexico will happen in South America.

Attention was called above to the general resemblance of the Andean plateau to our own Rocky mountain region. The tropical Andes are admitted to be richer in mineral resources than the Rocky mountains, but the present industrial development is very different. Our Rocky mountain states and territories are served by a good network of railroads, the State of Colorado alone having nearly five thousand miles, while the whole Andean plateau has less than five hundred miles and the lines have not penetrated to the richest mineral deposits.

In spite of their poor connection with the outside world, the Andes have produced enormous wealth. The bullion from their mines furnished the civilized world with the greater part of its money during the centuries of Spanish dominion. Between 1630 and 1803 Peru sent out a billion and a quarter dollars worth of silver. Bolivia has produced about four billion dollars worth. Of

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this enormous sum the famous mines of Potosi, which to-day can be reached only by a bridle path, yielded three billions.

Mining operations have changed but little during the past century. The mining district of Hualgayoc, Peru, for instance, has four hundred silver mines in an area of forty square leagues. Some of these mines are now yielding ores having three hundred ounces of silver per ton. The work is done by the Indians, who burrow around through the veins as best they can, getting out the ore with a drill and hammer and carrying only the richest of it to the surface in rawhide sacks. It is then picked over, crushed, reduced to a sulphate by crude methods and taken on muleback to the coast and shipped to Europe for refinement. At Huallanca, Peru, two hundred miles from the coast, ores worth thirty dollars per ton are thrown upon the waste heap because they are not worth transportation to the seaports. Yet to-day in our western states companies with large capital and expensive machinery are profitably reducing ores yielding from four to seven dollars per ton. In the copper mines at Corcoro, Bolivia, to the south of Lake Titicaca, the ores are blasted out and then hammered to pieces by women, who pick out the best portions. Owing to the scarcity of fuel, little of the ore can be treated on the spot, and that above seventy per cent. pure is carried away on pack animals. In many mines of the United States ores with but three or four per cent. copper are smelted.

The Bolivian mineral districts, in some places 200 miles wide, rich in tin, copper, silver and gold, extend north and south for a distance of seven hundred miles. The Antofagasta railroad has but just touched a corner of this field. The terminus of its line at Oruro is one hundred and ninety-five miles south of Lake Titicaca, and as the greater part of the Bolivian minerals are in the eastern ranges of the Andes, the railroads have not reached them. The city of La Paz, with a population of about a hundred thousand, is dependent upon a stage road forty-five miles long, and Cochabamba, with 25,000 people, has no outlet except a bridle path of greater length.

The improvements resulting from better transportation facilities are illustrated in the limited district that the Antofagasta railroad has reached, where changes have been made in the methods of operating the mines, and large quantities of ore are sent to the coast. One English company connected its mines with the railroad by building a branch line fifteen miles long, including two miles of tunnel. The venture is said to have paid well.

The railroad connecting the Peruvian seaport of Mollendo with the lake port of Puno carries out large quantities of mineral products, but, like the Antofagasta railroad, it has not tapped the main fields. The railroad has connections with the lake steamers that carry the products of the interior across from Chililaya, the port for La Paz and many similar towns. Some of these places are hundreds of miles away, and all freighting is done by pack animals.

A successful mining industry requires rail or water transportation. Mining machinery is costly and heavy, and cannot be introduced where pack-mule transportation is necessary. The securing of fuel and supplies and the marketing of the product are nearly as dependent on good transportation as is the introduction of machinery. Only the choicest ores can be carried on muleback, while the metal in such ores is almost infinitesimal in comparison with that contained in the low-grade ores.

When the railroads thoroughly open up the Andean plateau to the American capitalist and mining engineer there will be abundant opportunities for their enterprise. There are numerous mines that have been worked and abandoned at various times during the past three centuries, and in many cases their refuse ores are rich enough to yield good dividends. Not only can the old tailings be worked at a profit, but many of the abandoned mines themselves can be reopened, and the ores the early workers were forced to leave will make a good return when scientifically treated. The mines are now rarely worked beyond a few hundred feet, because they are not ventilated, and the ore is taken out by man power. With modern hoisting machinery, crushers, mills, furnaces and railroads, the mineral output can be very greatly increased.

The water power obtainable from mountains of the plateau makes possible the use of electricity instead of coal, as has been done in California, where coal is scarce. The great elevation of the mountains, and the frequent falls in the constant streams that flow from their snow fields and glaciers, combine to furnish the best conditions for the installation of electric plants driven by water power. Some of the most important mines of Mexico are now being operated by electricity supplied by the mountain streams, although the water power of Mexico is small as compared with that of the Andes.

A description of the conditions in the Cerro de Pasco mining district in Peru will show more definitely what is to be done in the new era of railroads that the canal will help to introduce. The Cerro de Pasco deposits are supposed by some to be an old volcanic crater cov-

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ering an area a mile and a half long and three-fourths of a mile wide. Here are two thousand veins of silver making a network through the hill in which there are no less than three hundred and sixty mines. From 1630 to 1824 these mines yielded 27,200 tons of pure silver. These deposits have been worked only 250 feet and could be drained by a tunnel of smaller magnitude than a number that have been made in various mines in the Rocky mountain states. After the building of a railroad, the introduction of the necessary machinery to complete this tunnel will become easy, the silver deposits will again become workable, and a new lease of life will be given to the Cerro de Pasco mines which have not yet been worked to a tenth of the depth reached in many mines in this country.

Underlying the silver of the Cerro de Pasco district are valuable deposits of low grade copper. The ore containing more than thirty per cent. of copper is now carried ninety miles to Casapalca on the Oroya railroad, where it is smelted by American smelters, or sent by rail to Callao for export to Europe by way of Magellan. At the present time more than a thousand tons of ore per month are being shipped from Cerro de Pasco by this method, and some of the lower grade ores are being treated on the spot by using coal brought from good deposits but a few miles distant. The present difficulties encountered in working these rich mineral deposits are shown by the fact that the railroad ties for tram lines at the mines had to be brought by pack mules from the railroad ninety miles away.

A railroad will, ere long, join the Cerro de Pasco mines with the Oroya line at the town of Oroya, the city which promises to become the railroad centre of that part of the plateau and to be connected by a line eastward with the head of navigation on the Perene, one of the branches of the Amazon, where tropical products can be secured for the mining regions around Cerro de Pasco. Another line of road may possibly start from Oroya southward through some of the already populous valleys of Peru possessing mineral resources.

THE INDUSTRIES AND TRADE OF THE EASTERN SLOPE OF THE ANDEAN PLATEAU.

The thorough development of the resources of the plateau by the building of railroads and the investment of foreign capital will necessarily be accompanied by an enlarged commerce with the eastern slope of the Andes. The people of the greater part of the plateau can produce only the food products of the temperate zone, and considerable quantities of tropic products are now brought up from the

east slope at great expense. Any thorough industrial development of the plateau will make necessary the building of railroads to carry on this trade in food products needed on the plateau. There are many fertile valleys in the east slope having an elevation of over five thousand feet, and resources and climate suitable to a great variety of tropical and semi-tropical products. Some of these products now cross the Andes and are exported. The eastern Andes are the source of the world's supply of coco leaves for the manufacture of cocaine, and there are many coco plantations scattered for hundreds of miles along the east slopes of Peru and Bolivia. This is also the region that furnished the world's supply of quinine before its systematic cultivation in the British East Indies, and the Dutch colony of Java had reduced the price of the article to one-thirtieth the former figure and ruined the owners of the Peruvian and Bolivian plantations.

The province of Cuzco, in eastern Peru, is famous for its cacao, of which some six hundred tons per annum are already sent over the Andes for export. These same valleys produce coffee, about fifteen hundred tons of which now cross the Peruvian Andes for shipment to the outside world. The most favored part of the east slope is in Bolivia, near La Paz, where, owing to a bend in the highlands, the slope is towards the north rather than towards the east, causing the trade winds to bring less mist and rain than they do to the eastern parts of Colombia and Ecuador. The rainfall of forty to seventy-five inches is the same as that of the most favored parts of the United States, and the climate is said by American travellers to resemble that of California, and to produce the same fruit products. The Yungas Valley in this section is noted for its coffee.

The eastern slopes of the Andes are so steep as to make an ordinary steam railroad expensive to build and operate. Coal would have to be brought from the Pacific coast, and the grades would make the hauling of heavy freight expensive. An electric railroad can be built here more cheaply, can ascend steeper grades, and can be operated by the unlimited supply of water power obtainable from the La Paz river. This stream even in the dry season is a rushing torrent twenty feet wide and three feet deep, falling ten thousand feet between La Paz and the head of navigation at Reyes, two hundred miles below. In some places rapids have a fall of 200 feet in half a mile. The valley through which the electric line would run contains several towns, one with 6,000, and another with 10,000 people. Trade is carried on through this valley to La Paz and the treeless plateau. In the vicinity of La Paz alone there are one hun-

dred thousand people who secure a part of their food supply and all of their wood from down the river by expensive pack animal transportation. This electric railroad, however, cannot be economically built or profitably operated until the city of La Paz itself is connected by rail with the Pacific. Such an extension (155 miles) is planned by the Antofagasta company.

When a railroad has been built across the plateau and connected with an electric line coming up from the plains of Bolivia, there will probably be a considerable export by the Pacific of products from

FIG. 1. THE WALL AND MAIN GATE OF CARTAGENA, A WALLED CITY WHOSE APPEARANCE HAS NOT MUCH CHANGED SINCE THE SIXTEENTH CENTURY.

this source. The alternative route is by the Madeira river and the Lower Amazon, but the engineering difficulties at the Madeira Papids are as great as those that lie in the way of the railroad to the Pacific. The heat and dampness of the Amazon route are deleterious to many products, such as hides, coffee, coco and cacao. This region is now exporting these products by way of the Pacific ports, and their movement in that direction would be greatly increased by the opening of such a railroad.

On the edge of the Sandia and Carabaya region, on the east slope of the Peruvian Andes, near Bolivia, an American company not long since paid $285,000 cash for a mine, carried machinery to it at a cost of $250 per ton, and is now crushing quartz ores and paying dividends. In the past the Spaniards secured much gold from the eastern rivers of Ecuador, Peru and Bolivia.

One of the easiest regions to reach east of the Andes is northern Peru, where it is planned to cross the narrowest part of the plateau and connect the Pacific ports with the headwaters of the Amazon. This road is partly surveyed and has been begun by a company having concessions to work a large coal field located near the summit of the Andes. The quality of this coal is reported to be good and the deposits extensive and easily workable. The location of this field near the divide of the Andes will make it possible to send coal to the Pacific and to the navigable parts of the Amazon, thereby facilitating steam navigation in interior Brazil.

As the Upper Amazon is a swift river, and the head of navigation ten times as far from the Atlantic as it is from the Pacific, doubtless some of the trade of the Upper Amazon country will come and go by Pacific ports after the opening of the Isthmian canal.

Industrial changes on the plateau and eastern slope cannot be expected to make much progress until better connection with the Atlantic shall have been provided. After this event the exploitation of the mineral wealth of the plateau may be expected to follow, and that will require the opening up of the eastern slope as a source of food supply for the laborers who work the mines.

INDUSTRIES OF THE PACIFIC SLOPE OF ECUADOR AND COLOMBIA.

At the western point of South America the climate of the coast changes and to the northward the desert gradually gives way to regions of increasing rains. The transition is made gradually. The southern part of the Ecuadorean coast is a fertile region with a tropical climate more healthful than many tropical localities. It has a population of about a quarter of a million and is practically the only part of Ecuador engaging in foreign trade, the interior being almost entirely cut off.

The greater part of the population of the coast plain of Ecuador lives in the valley of the Guyas river, on which is situated the City of Guayaquil. The only districts at present productive are those of the lowlands served by water transportation on the rivers centering at Guayaquil. This river system is navigated by many native boats

and a number of small American-built paddle-wheel steamers of the Mississippi river type. In the rainy season they can go 200 miles inland and bring to the coast the export produce. The soil of this valley produces tropical products in abundance, and the country is in a prosperous condition. The exports are cacao, ivory nuts, rubber, sugar, coffee, tobacco and hides.

The cacao is of excellent quality and is the chief crop. It is exported to the amount of twenty to thirty thousand tons per year, and constitutes one-third of the world's supply. At present more than half of the crop is produced in one small district, but it is estimated that 19,000 square miles in Ecuador are suitable for the pro-

FIG. 2. THE PRINCIPAL HOTEL OF BARANGUILA, THE METROPOLIS OF COLOMBIA.

duction of cacao, an article of which the world's consumption is increasing about five or six per cent. annually.

The ivory nut is the seed of a variety of palm that grows wild. Seventeen thousand tons were exported in 1898, chiefly to Europe, where it is used in the manufacture of buttons. In the same year about 2,500 tons of coffee were exported, $50,000 worth of tobacco, and considerable quantities of other tropical produce. The only manufactured export is the so-called Panama hat, and there are practically no manufactures of home products, all kinds of manufactured articles as well as temperate zone food products being imported from the United States and Europe.

Ecuador seems to have mineral wealth, but there are as yet no

wagon roads and no railways, nor have the mineral regions been much explored. There are quartz gold mines in the south and placer mines in the north, both being operated by foreign companies, one of which is an American firm said to be doing well. Petroleum, copper, silver and coal are reported, but at present they are not being developed. The railroad now building between Guayaquil and the interior will bring about the exploration and possibly the workings of the various mineral resources. This railroad will bring from the hills to the lowlands temperate zone products which must now be imported, and will stimulate the trade of the country by giving nearly a million people their first chance to trade with foreign countries. Any increase of Ecuadorean commerce means an increase in the traffic through the canal.

The rainfall increases from northern Ecuador to the Isthmus of Panama, the shore plain of Colombia being marshy and unhealthful. Its forests are uninhabited save by a few Indians and half-breeds, and the only export is a small amount of timber, although in some places vanilla and cacao are indigenous. The forbidding character of the coastal region has prevented the settlement of the higher lands on the foothills of the Andes, where in Ecuador and northward there are valleys above the malarial level with a salubrious climate and fertile soil.

THE CAUCA VALLEY IN THE COLOMBIAN ANDES.

The Andean mountains divide near the Ecuadorean boundary into three great ranges, the easterly one bending around into Venezuela, the western one trending towards the Isthmus of Panama, and the central one separating the Valley of the Magdalena and the Cauca rivers. The Magdalena Valley has its trade outlet by way of the Caribbean, but the mountains of Antioquia, in Central Colombia, cut off the valley of the Upper Cauca from the Atlantic and make it necessary for all commerce to come and go by way of the Pacific through the port of Buenaventura.

This Cauca Valley is in the Andean region, but unlike the other parts of the Andes of which we have spoken, it is both tropical and subtropical, having an elevation of from 3,300 to 6,000 feet. The valley is larger than the State of New Jersey and contains one of the densest populations in South America. There are half a million people, comprising negroes, in the lower portion of the valley, and Indians and a considerable white population in the adjacent highlands. This section is truly Andean, however, inasmuch as it is cut off from the ocean by a range of mountains and has to depend upon

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pack-mule transportation for all of its commerce. The people do a little gold mining, but live chiefly by agriculture, importing nearly all of their merchandise, except some domestic manufactures of straw hats, coarse cloths and utensils.

All the internal traffic of the valley as well as its foreign trade is carried over trails, the exports of agricultural products being limited to the most valuable articles, such as coffee and cocoa of the best grades, although corn, sugar, tobacco and fruits are cultivated, and cattle are raised. Concessions have been given for a railroad to go through the valley from the port of Buenaventura and twenty miles of the line have been built, but the enterprise has come to a standstill. The completion of this line and the opening of an Isthmian canal would bring the producing districts of the valley into close connection with the commercial world.

At present Buenaventura is in the traffic territory of the Panama railroad and steamship lines, whose freight charges are high. During the year 1900 such typical articles as wire and nails were taken from New York to China for $8 a ton, but it cost $15 to land them at Buenaventura, 7,000 miles nearer. From there the costs were $8 per ton to the end of the railroad, and $40 per ton additional by pack mule over the pass of the Andes, 6,000 feet in elevation, to Cali, 77 miles from the ocean. The mule transportation cost seventy cents per ton per mile. After reaching Cali some of the goods had to double the freight charges of $63 per ton by being carried many miles up and down the valley. At the same time the steel manufactures of Pittsburg were paying an unusually high freight charge of $3.60 per ton to the seaboard.

The opening of the Isthmian canal, the building of the railroad, and the introduction of foreign capital would be revolutionary in their effect upon the trade of the Cauca Valley. The first effect of the building of the railroad would be to increase the importation of machinery for agriculture and the smaller industries. The continuation of the railroad up and down the valley would make it the route of transportation to the promising gold mines in the adjacent provinces of Colimo and Antioquia. The valley would export coffee, cacao, animal products and raw sugar.

SUMMARY OF THE EFFECT WHICH THE CANAL WILL HAVE ON WESTERN SOUTH AMERICA.

Each of the five industrial divisions, discussed above, of the tropic Pacific section of South America is rich in resources and

backward in industrial development. Capital is only beginning to overcome the difficulties that political and geographical conditions have placed in the way of progress. Nearly all of this region is still in the pack-mule stage of its industrial life. The present trade conditions there are more backward than were those prevailing in the trans-Missouri territories of the United States fifty years ago. At that time Kansas City and Fort Leavenworth were the entrepots of a

FIG. 3. A STREET SCENE IN TURBACO, A TOWN OF 2,000 INHABITANTS, TWENTY MILES FROM CARTAGENA. IN MANY CITIES OF SPANISH-AMERICA THE WATER FOR DOMESTIC USE IS CARRIED TO THE HOUSES ON THE BACKS OF DONKEYS.

brisk and thriving trade with the far western frontier. Every spring trains of covered wagons, "prairie schooners," went across the great plains to the Spanish settlements of New Mexico, distributing supplies en route at the distant settlements and isolated ranches and trading posts of the hardy pioneers and trappers who had pushed on toward the Rocky mountains. Freight rates, ranging from $40 to $200 per ton, excluded from trade all articles except

necessities and limited the return cargo to such valuable commodities as furs, skins and bullion. If we substitute the pack mule for the more efficient prairie schooner, the above description applies to most of the tropic Pacific section of South America. Limited areas are served by the few lines of railroads, and by some river steamboats.

The tropical Pacific section has twice the population, and but little more than half the trade of the temperate Pacific section. The 3,000,000 people of the temperate region carry on a foreign commerce amounting to $100,000,000, and the rest of the west coast commerce amounts to about $55,000,000. The exports exceed the imports by about four millions. As in the case of Chile, the trade is nearly all with European countries.

Like the temperate section, the tropical region produces the raw materials we need and buys manufactures we might supply. The British cottons, for instance, purchased by Ecuador in 1898 were more valuable than all her imports from this country. After the Isthmian canal is opened, our cotton mills will secure that trade. The canal will facilitate the development of the resources of the tropical Pacific section and thus enlarge the sale of American railway supplies and agricultural and mining machinery. The purchasing power of the South American people will increase and trade with the United States will grow, not rapidly, but steadily and to ultimately important dimensions.

(THE END.)

GREAT CANALS OF THE WORLD*

SHIP canals connecting great bodies of water and of sufficient dimensions to accommodate the great modern vessels plying upon such waters are of comparatively recent production and few in number. The one great example of works of this character which has been a sufficient length of time in existence and operation to supply satisfactory data as to cost of maintenance and operation and practical value to the commerce of the world is the Suez canal, and for this the available statistics begin with the year 1870, while

* Condensed from a study prepared by the U. S. Treasury Bureau of Statistics, and published in the current volume of the Monthly Summary of Commerce and Finance.

its new and enlarged dimensions only date from the year 1896. For the Sault Ste. Marie canal, connecting Lake Superior with Lake Huron, statistics date from 1855, though for the canal in its present form they cover but about four years. Statistics of the Welland canal date from 1867, but for the canal in its present enlarged form cover only two years of operation. The other great ship canals of the world are of much more recent construction and data regarding their operation therefore cover a comparatively brief term, and in some cases are scarcely at present available in detail.

The artificial waterways which may properly be termed ship canals are nine in number, viz.:

1. The Suez canal, begun in 1859 and completed in 1869.
2. The Cronstadt and St. Petersburg canal, begun in 1877 and completed in 1890.
3. The Corinth canal, begun in 1884 and completed in 1893.
4. The Manchester ship canal, completed in 1894.
5. The Kaiser Wilhelm canal, connecting the Baltic and North Seas, completed in 1895.
6. The Elbe and Trave canal, connecting the North Sea and Baltic, opened in 1900.
7. The Welland canal, connecting Lake Erie with Lake Ontario.
8 and 9. The two canals, United States and Canadian, respectively, connecting Lake Superior with Lake Huron.

The description which is given of each of these great waterways shows that the length of the Suez canal is about 90 miles, the cost $100,000,000, the present depth 31 feet, width at bottom 108 feet and at the surface 420 feet, and that the number of vessels passing through it has grown from 486 in 1870 to 1,494 in 1875, 2,026 in 1880, 3,389 in 1890, and 3,441 in 1900. The tolls charged are about $2 per net registered ton.

The Cronstadt and St. Petersburg canal, which gives a passageway for great vessels to St. Petersburg, is 16 miles long, including the deepening of the bay channel, 20½ feet in depth, and the total cost is estimated at $10,000,000.

The Corinth canal, which connects the Gulf of Corinth with the Gulf of Aegina, is 4 miles in length, 26¼ feet in depth, 72 feet wide at the bottom, cost about $5,000,000, and reduces the sailing distance about 175 miles. The average tolls charged are 18c. per ton and 20c. per passenger.

The Manchester ship canal, which connects Manchester, England, with the Mersey river and Liverpool, was opened in 1894. Its

length is 35½ miles, depth 26 feet, width at bottom 120 feet and at the surface 175 feet, and cost $75,000,000. The commerce on the canal shows a growth from 879,204 tons in 1895 to 1,492,320 tons in 1900.

The Kaiser Wilhelm canal, which connects the Baltic and North Sea through Germany, is 61 miles in length, 29½ feet in depth, 72 feet wide at the bottom, 190 feet wide at the surface, and cost about $40,000,000. The number of vessels passing through it has increased from 19,960 in 1897 to 29,095 in 1900, of which number 16,776 were sailing vessels. The tonnage in 1897 was 1,848,458, and in 1900, 4,282,094 tons. An additional canal connecting the same bodies of water by way of the Elbe and Trave rivers was opened in 1900. Its length is 41 miles, depth about 10 feet, width 72 feet, and cost $6,000,000.

The great North Holland canal, which connects Amsterdam with the sea, cut in 1845 but deepened at a later date, has now a depth of 20 feet, a width of 125 feet at the surface. The Caledonian canal, which connects the Atlantic and North Sea through the north of Scotland, is 17 feet in depth, 50 feet in width at the bottom, 250 miles long, cost $7,000,000, and is at its highest point 94 feet above sea level. The Canal du Midi, cut through France from Toulouse on the Garonne to Cette on the Mediterranean, a distance of 150 miles, is 6½ feet deep, 60 feet wide, and 600 feet above sea level at its highest point, and has 114 locks; total cost, $3,500,000.

In America the canals connecting the Great Lakes are the principal ship canals and are three in number: the Welland canal, originally constructed in 1833 and enlarged in 1871 and 1900; the Sault Ste. Marie, or St. Mary's river canal, opened in 1855 and enlarged in 1897; and the Canadian canal at St. Mary's river, opened in 1895. The American and Canadian canals at St. Mary's Falls are practically identical in location and dimensions, and are used interchangeably by vessels engaged in commerce, as convenience may dictate. The depth of the canals at the St. Mary's river is sufficient to accommodate vessels drawing 20 feet of water. The American canal was originally constructed by the State of Michigan, but subsequently taken charge of by the United States and enlarged at a cost of $2,150,000. The cost of the Welland canal was about $30,000,000, largely due to the fact that 25 locks are required in surmounting the rise of 327 feet in the distance of 27 miles. The number of vessels passing through the canals at St. Mary's river has greatly increased during the past few years, while the number

passing through the Welland canal has materially decreased; the number passing through the St. Mary's canals being in 1873, 2,517, and in 1901, 20,041, of which 15,837 passed through the United States canal, and 4,204 through the Canadian. The number of vessels passing through the Welland canal has decreased from 6,425 in 1873 to 2,202 in 1899. The marked contrast between the business of the St. Mary's Falls and Welland canals is largely due to the fact that the freights originating in the Lake Superior district are chiefly discharged at Lake Erie ports, and those destined for the Lake Superior region are chiefly produced in the section contiguous to Lake Erie, the Lake Superior freights being chiefly iron, copper and grain, and the Lake Erie freights for Lake Superior, coal and manufactures. The business of the St. Mary's Falls canals by far surpasses in volume that of any other canal of the world, the freight tonnage of the American and Canadian canals combined being in 1901, 24,626,976 registered tons, while the net tonnage of the Suez canal in 1900 was 9,378,152 tons, and that of the Kaiser Wilhelm canal 4,282,094 tons.

EDITORIALS

A FEW days ago the firm of Burnham and Williams gave a great banquet at the Union League Club in Philadelphia, celebrating the seventieth anniversary of the establishment of the Baldwin Locomotive Works, and also the completion of the 20,000th locomotive. One of the after-dinner speakers was Mr. J. Harris Sanders, of London, England. He spoke of America as being of all the nations, first in finance, in agriculture, in manufactures, in education and in locomotion. As reasons for this progress he said that Americans are more temperate than either Englishmen or Frenchmen, and that there is a higher standard of education here, both in elementary schools and colleges.

This last point, of standards of education, is a vital one, and it is recognized in the schools of Germany in a revolutionary way, the Emperor's influence being a powerful force in establishing technological schools, and in putting such education on so high a basis as to be given equal rank and privilege with the ancient classical establishments.

AT the recent dedication of the laboratory which Mr. Andrew Carnegie presented to Stevens Institute of Technology, he called attention in a very forceful way to the same conditions by which this country by a higher education in the theoretical and applied sciences is forging ahead of England.

This awakening to the fact that pupils should "go to school to learn to think; and that this may be learned equally well while studying botany or physics, manual training or Latin grammar, agriculture or geometry," has reached the universities, and departments of training in technology, in business methods, commerce and geography are being widely established. A very great step in advance along this line is the plan of Mr. Carnegie to establish a strictly technological university at Pittsburg. Another, which at the same time is a very high compliment to America, is the proposed establishment at Chicago of a college of commerce, by the French people, in which French students shall be trained in American methods. In a lesser way several universities are gradually developing commercial training and establishing bonds between the work done within their walls and the life men have to live after graduation. One of the most significant of these is a course of open lectures in progress at the University of Chicago during the present year. In this course lecturers are chosen who hold responsible positions in the actual business world, and it is instructive to notice that in the list of nineteen lecturers chosen only eight are recorded as having the advantages of a higher education. Yet they are all eminent as leaders in their several fields. In another column will be found the list of lecturers and the subjects of their lectures. Such a course is a distinct advance, and may well be copied by other institutions.

PROFESSOR I. C. RUSSELL, the well-known geographer of the University of Michigan, Ann Arbor, Mich., presents in *Science* of January 31 a strong plan for the closer organization of geographic work in the United States that ought to receive universal attention and frank discussion throughout America.

Professor Russell suggests that all the geographic societies in the Americas join forces as an American Geographical Society, taking the meaningful name, so long borne by the oldest, and in many ways the foremost geographic society in America. He further suggests that there be branches or sections established in different cities, each section to run its own affairs, to have its own officers, and to be largely independent, except that it contribute funds toward the

central society for publications, research, etc. Such a plan has long been followed in the case of the American Chemical Society, and is now being adopted by the American Psychological Association.

The plan has many strong points in its favor, and all interested should write to Professor Russell without delay.

GEOGRAPHY CURRENT

ASTRONOMY

The Planets for March.—Those who wish to observe the planets during the coming month will be obliged to rise early in the morning, for with the single exception of Neptune, no one of them appears above the horizon until after midnight. About an hour before sunrise, however, all of the naked eye planets can be detected toward the close of the month, and Venus and Saturn are quite conspicuous morning stars.

Mercury is too far south of the sun to be noticed readily. It will rise about an hour before the sun until March 20, and may be found, if the conditions of weather are unusually favorable, about 20 degrees south of the point of the horizon at which the sun rises.

Venus is the brightest of the morning stars. It rises from an hour and a half to two hours before sunrise and will attain its maximum brilliancy on March 21.

Mars becomes a morning star on March 29; the planet is very close to the sun throughout the month, and is also rapidly receding from the earth, its greatest distance being reached during the latter part of May. It is hence very faint, and will not be again suitably situated for observation for several months.

The Constellations.—*The Great Bear.* In these early months of the year, it is the most brilliant portion of the sky which is visible. The magnificent constellation of Orion in the south, with Taurus, Gemini and Auriga above it, Leo and Cancer in the east, and Cygnus, Pegasus and Andromeda in the west, fill the sky with a more striking series of constellations than can be seen at any other season of the year. It is our purpose to consider the principal constellations in succession, showing by appropriate diagrams how to trace them

out in the sky, and to indicate in each all the objects of interest within reach of an ordinary opera glass. In this way we shall in time completely cover the whole sky. This will be begun in the April number. In the meantime, it may not be without interest to notice briefly the one constellation which is probably known to every one—the Great Dipper or Bear.

Ursa Major. If the observer will face toward the north early on any evening during this month, he will see seven very bright stars forming a figure much like a large dipper with a broken handle, the break occurring at the sixth star from the front edge of the bowl. The constellation is a little east of north; the handle of the dipper points, at sunset, downward toward the horizon and the dipper hence appears as if balanced on the handle.

If the constellation be observed again a few hours later, it will be seen to have changed its position, until at 3 A. M., the dipper will be nearly right side up and resting parallel to the horizon. This change of position is, of course, due to the apparent rotation of the whole sky about an axis joining its north and south poles. If the observer will make occasional short observations of the constellations at intervals of a few hours, he will quickly detect that they are all in motion, and in a short time he will doubtless be able to discover for himself what the nature of this motion is. It is well to begin, for this purpose, with a constellation like Ursa Major, the greater part of which remains always above the horizon, to an observer in latitude 40°N.

It will be seen that the apparent change of position of this constellation is merely a revolution of the whole constellation about a fixed point. It has been, in fact, suggested that its name may have been derived from this apparent motion, since it

> "Round about the pole does make
> A circle like a bear at stake."

but a few night's watching will convince the observer that every star in the heavens circles around and around this same pole also.

This rotation can readily be completely learned by a few nights of observation. The uniform increasing motion of the heavenly bodies, which has proceeded with awful regularity, night after night, since our world began, is so beautiful a spectacle that he who has never understood it has missed one of the most impressive sights of nature.

"The sad and solemn night
Has still her multitude of cheerful fires;
The glorious host of light
Walk the dark hemisphere till she retires,
All through her silent watches, gliding slow,
The constellations come, and climb the heavens, and go."

The seven stars of the great dipper form but a small part of the constellation of Ursa: the handle is, in fact, only the tail of the bear. The group has received various names: Charles' Wain, in England, the Seven Bears in India, and the Great Wagon among the Danes, Swedes and Icelanders. In Job XXXVIII., 32 (revised version), there is mentioned the "Bear with her train," the train being the three last stars of the handle of the dipper. It is a singular fact that the North American Indians named this constellation the *Bear* before they had any intercourse with white men.

The first of the seven stars was discovered to be a close double by Burnham in 1889; the sixth is also a binary star, that is, a star composed of two suns revolving about one another, and this was the first of all the binary stars to be discovered.

The seventh star is named *Mizar:* near it will be seen a faint bluish companion which the Arabs named *Alcor.* This little object is said to have been used as a test of sight by the Arabs, though now it is by no means difficult. There is an old story also that it is the lost Pleiad, *Electra,* who had wandered here from her companions.

Mizar and Alcor, with the fainter stars grouped near them, form a fine object for a small telescope. They are approaching us at the rate of 19.5 miles a second, and in fact all seven of the stars except possibly the fourth, are approaching our system. Flammarion concludes from this "star drift" that 50,000 years ago the constellation had the form of a magnificent cross. This is very uncertain; but it is definitely known that all of the stars in the sky have slow relative motions, and that the appearance of the heavens in the remote ages will be very different from what it is at present.

PHYSIOGRAPHY

New Zealand in the Ice Age.—Dr. C. H. Hitchcock, in the *American Geologist* for November, 1901, prints an illustrated paper on "New Zealand in the Ice Age," which gives a general view of the geographic features of New Zealand with especial attention to glacial features of the present time. The titles of some of the principal paragraphs are the Fiord Region, the Southern Alps and

Glacial Fans and Flood Plains. Among other interesting conclusions Dr. Hitchcock states that the Southern Alps surpass those of Switzerland in all that makes the latter famous.

J. A. D.

HYDROGRAPHY

The Desiccation of Lake Ngami.—The desiccation of Lake Ngami, in South Africa, has made very rapid progress in the past ten or twelve years. When Livingstone reached the lake in 1849 he found it covering an area of about 300 square miles. The lake has now entirely disappeared. Its place is wholly occupied by a somewhat marshy plain covered with reeds, and no vestige of water surface is to be seen. The Taoge affluent has entirely dried up for about twenty miles from the lake, and above that point it is gradually disappearing. The inhabitants have abandoned their numerous villages around the lake, and only a few cattle-raising tribes remain.—*Geographische Zeitschrift*, 1900, p. 333.

The Arid Lands of the West.—The rapid growth of public interest in the subject of irrigation, and the prominence it is assuming in national policy, raise a natural inquiry as to the extent of the arid regions, so called, which require irrigation. The one hundredth meridian, west longitude, divides the United States into two nearly equal portions, passing through western Texas, Oklahoma, Kansas, Nebraska and the Dakotas, and may be said to represent approximately the border line between the humid East and the arid West. That is to say that the annual rainfall east of this line is relatively so much greater than that west of it that the one section may properly be called wet and the other dry. The practical effect of this difference in precipitation is, that west of the meridian "dry farming," as practiced in the east, is impossible, except in a few favorable localities, and agriculture, to be successful, must be carried on by artificial watering or, as it is commonly called, by irrigation. This region comprises over 900,000,000 acres, of which, owing to the prevailing aridity, about 600,000,000 acres, or an area equal to nearly one-third of all Europe, are still public lands and unoccupied, though they are in part extremely fertile and would yield valuable crops if irrigated. Water for irrigation is taken mainly from the rivers, and the investigations and measurements of flow, which the United States Geological Survey has been conducting for a number of years, show that there is sufficient available water, if properly conserved by storage reservoirs and augmented by the

artesian supply, to reclaim about 75,000,000 acres of this unoccupied land. It is estimated that this territory when reclaimed will readily support a population of 50,000,000 people.

G. B. H.

PHYTOGEOGRAPHY

The Chayote, a Valuable Tropical Plant.—Among recent descriptions of economic plants of the tropics is that of the Chayote by Mr. O. F. Cook.* The tropics have not an abundant supply of herbaceous and annual plants, which for food purposes will correspond to the vegetables of the temperate regions. The denseness of the higher foliage is not usually conducive to the growth of herbaceous plants. Consequently, although many useful plants of the temperate regions have been derived from species indigenous to the tropics, several of them have become really important only since their introduction into temperate regions. These must be rather rapid-growing plants, however, which will mature within the limits of the growing season. The Chayote (pronounced Chi-o'tay) does not mature rapidly, and is confined to such countries as Porto Rico, Mexico and subtropical America.

The plant is a member of the family to which belong melons, squashes and cucumbers, but within this family it has wide variations from these common vegetables. Although a climbing vine, the plant in itself is not unlike the cucumber vine. The melon-like fruits are pendant from the vine and bear a resemblance to gourds. In form the fruits are usually oblong or pear-shaped and flattened, with the surface strongly marked by longitudinal ridges and depressions; in size varying from an inch and a half to nine inches, and weighing from four ounces to two pounds. From this type there are variations ranging from well-rounded forms to those decidedly elongated. The fruit contains a single large seed which is very short-lived, the latter characteristic being supposed to account for the extreme slowness with which the range of the plant is widened.

The popularity of the fruit with the peoples where it is native is such that it is one of the leading market vegetables. It grows with little or no cultivation, and its perennial roots reduce the necessity of planting. The fruit may be eaten as our melons are, or may be cooked in a variety of ways. The shoots make an excellent substitute for asparagus; fibres from the ripened vines are quite fine and strong, and are often used in constructing fancy baskets, ladies'

* Mr. O. F. Cook, "The Chayote: A Tropical Vegetable, Bull. No. 28, Division of Botany, U. S. Department of Agriculture, 1901.

hats, etc. The tubers which often contain large quantities of starch are edible, and these as well as the vines make excellent feed for farm animals. So much nectar is found in the flowers that the plant is quite a favorite with bees.

The Spaniards and English first discovered the Chayote in Mexico, and since then it has been distributed throughout tropical America, Australia, and into many other tropical and subtropical regions. It has been grown in southern California for many years, and is known in a restricted region about New Orleans. It is believed that a much wider range for the plant in this country is possible and attempts are being made to introduce it.

O. W. C.

Peanuts in the Senegal.—The peanut has been cultivated from time immemorial by natives of tropical Africa as an article of food. The inhabitants of the Senegal produce it in great quantities, and as the traveller ascends the river he finds the shores better and better cultivated. The production in the Senegal has developed considerably in the last ten years; the harvest of 1899 was estimated at 125,000 tons, with a value in the colony of $3,860,000. The chief markets are established along the railway from Dakar to St. Louis.

The cultivation of the peanut is very easy and constitutes the real wealth of Senegal, where, on account of the great fertility of the soil, only a little intelligent labor is demanded to produce a large yield. Unfortunately, the blacks are generally indolent, with a fatal lack of foresight, and do not like to apply themselves to the work of the field.

The native of Segenal cultivates only millet, upon which he lives, and the peanut, which he sells to the Europeans established in the country, providing himself with the barest necessaries of life from the proceeds of the sale. He works scarcely six months in the year. In the month of June he roughly digs up the ground which he has chosen for his future harvest, and then rests until the rainy season, which commences in July and continues into the first week of October. The ground is prepared by means of a peculiar crescent-shaped hoe, fitted into a long pole, with which the native rakes over the surface of the earth to a depth of nearly four inches; this operation finished, he burns the weeds which he has uprooted. As soon as the first showers appear, women, children—in short the whole family—abandon their villages for some days and stir up the ground with a hoe a second time; then they make little holes, into

which they drop two or three seeds, covering them with a little earth, which is pressed down with the foot. The plants must be weeded two or three times to keep them from being choked.—*La Gazette Coloniale,* Jan. 6, 1901.

A New Forest Reserve.—By order of the Secretary of the Interior, a new Forest Reserve has been established in Montana, north and west of the Kootenai river, to be known as the Kootenai Forest Reserve. It will contain about 1,276,000 acres.

ANTHROPOGEOGRAPHY

Killing of Languages.—How much respect for liberty is there in a country like Germany, where sixty schoolboys have been tried for the offense of belonging to a society the sole object of which is to promote the study of the Polish language and literature? We spoke lately of patriotic efforts to revive the dying or dead languages; quite as much might be said of efforts to limit or destroy the use of a language. It is recognized by the German authorities that language is the chief distinguishing badge of nationality, and if the Polish language can be replaced by German in the annexed Polish districts the German sentiment will grow with the German language. The Germans are now doing their best to expel French from Alsace, as the French language had previously expelled German. It is largely the fight of languages that makes the trouble in polyglottal Austria. In Finland the Russians are expelling the Finnish tongue from the schools and the press, as they are driving the German out of the districts and the higher schools where it was in use. In our own country it is the policy of our Indian Bureau to require the use of English in Indian schools, although no further restraint is put on the use of the Indian tongue. We are inclined to think that the best work for the Indians has been done in schools where both the English and the native tongue have been used. The French, in taking possession of territory previously under English influence, as in Madagascar and the Gabun, have immediately suppressed, with some severity, the use of any language for education but French. Yet it is a fact that the American way of letting every language of an immigrant race have fair play works the best. Thus English is almost the exclusive language of the second generation of our immigrants, whether their parents were German, Italian, Poles or Russians. So Spanish or Portuguese became the ready language of South America, not by repressing the native languages,

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but from the fact that the European tongue, being that of culture, became the ready solvent for all the irreconcilable native barbarisms.—*The Independent.*

Growth of Education in Porto Rico.—In a recent lecture at the University of Pennsylvania, Professor Martin G. Brumbaugh, Commissioner of Education in Porto Rico, gave an interesting account of progress there. During the last year illiteracy was reduced six per cent., with an average attendance in the schools of 75 per cent. "being the largest gain in literacy, and with Massachusetts excepted, the largest average of any country or State under our flag." The teachers are chosen solely upon merit.

"At the beginning of the school organization by the military Bureau of Education, there were 940,000 human beings in Porto Rico, of whom 88 per cent. were illiterate. The Bureau enrolled about 23,000 pupils, and the school expenditure for 1899–1900 was $330,000. In the next school year there were 38,000 pupils enrolled, and the expenditure was $400,000. This year, with a budget of $501,000, there are 992 schools and 50,000 pupils enrolled, while the teaching force consists of 100 teachers from the States and upward of 800 natives. The native teachers almost all teach English.

"Text-books and supplies are furnished to all pupils absolutely free. A first-class normal school is in operation, with an enrollment of nearly 200 students. A new normal school building is being erected at a cost of $40,000, and high schools, as good as any in the cities of equal size here, are organized in every city in which pupils are ready to pursue the course."

ECONOMIC GEOGRAPHY

Bombay and the Suez Canal.—The effect of the Suez canal upon the fortunes of Bombay illustrates the profound influence of canals in shortening sea routes. Bombay, now the greatest Asian port, was far inferior to Calcutta in importance till the Suez canal reduced the sea distance from Southampton to Bombay by 4,800 nautical miles. The advantages for trading with every European port, which it thus gained, made Bombay the emporium of India. It became a great exporter of wheat, formerly not available as an export article because it was too heavy, in proportion to value, to pay steamer freight charges around the Cape; and it could not bear transport on slow sailing vessels across the tropics without deterioration. A part

of Bombay's prosperity is also due to its proximity to the Indian cotton fields, which have made the port the greatest centre in Asia of yarn spinning and coarse cloth manufactures for Asian and African markets. C. C. A.

Manufactures in the State of Maine.—The last census report of manufactures in Maine points out that the thirty-three per cent. increase in manufactures during the last decade has been due in an important degree to the extensive water power of the state. Its 1,620 lakes, having a total area of 2,300 square miles, and located in many cases near the heads of rivers, are valuable reservoirs of manufacturing power. The total available water power has been estimated at between one and two million horsepower.

The manufacture of cotton goods is the most important industry in the state, yielding a product valued at $14,631,006. The water power of Maine early attracted the attention of manufacturers of cotton goods. One of the pioneer mills was established at Brunswick in 1809, another at Walton in 1810, and a third at Gardiner in 1811. Lewiston is now the chief centre of the industry, while the twin cities of Biddeford and Saco rank next. At present the cotton mills of Maine are all west of the Kennebec river. They are located without exception at the falls of large rivers, and are operated by water power.

The second industry of the state is the manufacture of lumber and timber products. Lumbering was begun at an early period in Maine, and has continued to be a leading industry. The first saw mill was erected at South Berwick about 1634, and fifty years later the number had increased to twenty-four. Dams and canals have been built, steamers have been placed on the lakes to facilitate log driving, and in one instance, at Northwest Carry, Moosehead Lake, a log sluice has been constructed, at large expense, to convey logs overland from the west branch of the Penobscot river to Moosehead waters, the source of the Kennebec. Several woodworking plants have been established in many parts of the state, especially at points accessible to the raw material.

The manufacture of paper and wood pulp almost equals the lumber industry in the value of its products. The discovery of wood pulp as a material for paper manufacture was important for Maine. One of the pioneer pulp mills in the state was erected at Brunswick in 1870. Since that date numerous plants have been built; they are located chiefly along the three principal rivers of the state, the Androscoggin, Kennebec and Penobscot.

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Flour and grist milling is another important industry. From the early settlement of the state mills have been in use for grinding corn, wheat and other grains. Small streams affording water power were abundant in every section, and grist mills were erected in every considerable settlement. At first these mills were crude, the millstones being cut from the rock in which the country abounded, and serving only to grind the grain into meal; but in time the improved stones were introduced, and much excellent flour was made for home consumption. The early grist mills of Maine, as a rule, did custom grinding only; but later an extensive wholesale trade grew up in the larger cities, where mills of greater capacity were erected. As a result, cornmeal, instead of whole corn, is now largely distributed to retailers throughout the state.

Two other active industries of Maine, fish canning and shipbuilding are intimately connected with its geographic environment, in the one case the fishing grounds off the coast, and in the other the abundant forests together with the indented shoreline affording fine harbor facilities.

E. C. S.

Seaports, in Trade and Manufacture.—It is well to distinguish between seaports that are devoted almost wholly to commerce and those which combine large manufactures with trade. Marseilles has nearly four times the population of Hâvre, largely because it retains much of the imported raw materials until it can send them out again in the shape of manufactures to other markets; it therefore provides work for a large industrial population, while Hâvre, on the other hand, manufactures little and is strictly a forwarding port, retaining only a small amount of the commodities coming to it from land or sea. The forwarding business is very profitable, and is the great feature in many ports, as Amsterdam, Rotterdam, Singapore, Hongkong and Shanghai; but the greatest seaports are those which combine manufactures with trade. The ports named above are mainly collectors and distributors of raw and manufactured products produced elsewhere.

C. C. A.

The Study of Economic Geography in the schools is valuable as a means of education in proportion as it gives the pupil a basis for accurate facts and generalizations and develops the power of thinking out the true relations of the economic phenomena that will come to his attention every day of his business life. If this training is

thorough and adequate he will be helped by it to look for and determine the causes and effects of facts and experiences that concern him personally, or influence the world's enterprises.

The most significant economic news of the day should therefore be used in the class room to develop the faculty and practice of reasoning out the real meaning of the facts presented. Statements worthy of credence in reliable newspapers and other publications may constantly serve to illustrate principles enunciated in the textbook; for example, the recent reports that Melbourne is still slightly decreasing in population and that Sydney is likely to head the list of Australian cities at the next census.

Briefly indicated, the reasons for this change of position are: (1) Melbourne owes her phenomenal development to gold, of which $50,000,000 were long taken annually from the mines near her, while Sydney's progress has been due rather to the slower but more permanent processes of agricultural, grazing and industrial growth. Melbourne's mines now hold second rank in Australia, and the resources which feed her export trade, though very important, are confined mainly to the small state of Victoria; (2) Sydney is on the east coast, where population is most dense and all activities except mining have the largest development; all this east coast is tributary to Sydney, for the foreign relations of the other coast cities are mostly carried on through its port. Sydney is thus a great distributary for the entire eastern coast trade, but Melbourne's home trade is local, being confined almost wholly to Victoria; (3) Sydney looks out upon the island world of the Pacific and has trade relations with many of the groups, while Melbourne fronts the southern Indian ocean barren of islands; (4) the large coal mines of Newcastle, at the door of Sydney, feed her rapidly-growing industries, while Melbourne brings fuel from a greater distance; (5) the sum of Sydney's commercial advantages have induced transoceanic lines to make that port their terminal point. C. C. A.

Industrial Development in Louisiana, long retarded by the high price of fuel, has now a better outlook, according to the *Census Bulletin* on the manufactures of that state. The completion of a part of the improvements of the Black Warrior river from the heart of the Alabama coal region and the opening of the short canal connecting the Mississippi with the Gulf of Mexico through Lake Borgne, have given through water rates for coal from the nearest mines, thus lessening the cost and creating competition with coal

from Pittsburg and other fields. The discovery of fuel oil in Texas and Louisiana has also furnished a cheap substitute for coal.

C. C. A.

GEOGRAPHIC TEACHING

Block Diagrams.—The block diagrams that have been recently used by some teachers have had for their object a combination of surface form and underground structure, so that the latter might be used to aid in explaining the former. Our attention has lately been called to two publications containing several of these diagrams in which the perspective is so much at fault as to give an unsatisfactory impression. The intention of diagrams of this class is

FIG. 1

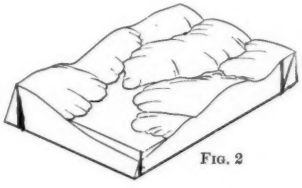

FIG. 2

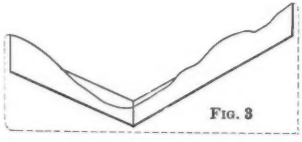

FIG. 3

shown in figure 1. Two sides and the upper surface of a shallow block are here seen, all vertical lines being drawn vertical, while horizontal lines are drawn oblique. If a flagpole, a church spire, or an Eiffel Tower were to be represented on the land surface, it should be drawn vertical on the paper, parallel to any one of the visible vertical edges of the block.

In the diagrams above referred to as unsatisfactory, the outline is arranged as figure 2. Not only the horizontal lines are drawn oblique, but vertical lines, as seen in the edges of the block, are also given slanting attitudes. The block then seems to be tilted; it loses the appearance of stability that is naturally associated with vertical lines. It would be improved if a diagram, traced from figure 3, were cut out around the dotted line and set on figure 2 so as to give the latter vertical sides. The observer must then, truly, imagine himself raised above the block so that he may look

obliquely down upon it; but he need not imagine that the block has been tilted up so as to show itself to him.

W. M. D.

Courses on the Philippines.—Dr. Paul Haupt announces special provision made in Johns Hopkins University for instruction in Tagálog. In the second semester a series of lectures will be given on the Philippine Islands, with especial reference to the ethnology and linguistics of the various tribes of the archipelago. These courses are offered by Dr. F. R. Blake, who is also preparing an English manual of Tagálog for practical purposes.

Lectures on Industrial Topics.—A very significant series of lectures on questions of the highest interest to students of commerce is in progress at the University of Chicago, in the College of Commerce and Administration. The purpose is to supplement the more purely theoretical class room work with talks from men who have themselves acquired distinction as practical men of affairs. The course is as follows:

I. The New Education, by Professor J. Laurence Laughlin.

II. On Railroads: (1) Railway Management and Operation, by A. W. Sullivan, assistant second vice-president Illinois Central Railway. (2) Railways as Factors in Industrial Development, by Luis Jackson, industrial commissioner Chicago, Milwaukee and St. Paul Railway. (3) Some Railway Problems, by Paul Morton, second vice-president Atchison, Topeka and Santa Fé Railway. (4) Railway Consolidation, by E. D. Kenna, vice-president Atchison, Topeka and Santa Fé Railway. (5) Railway Finance, by Edwin H. Abbot, formerly president Wisconsin Railway (three lectures). (6) The Railway Mail Service, by Dr. Geo. G. Tunell, secretary to the president, Chicago and Northwestern Railway.

III. Modern Industries: (1) The Steel Industry, by Franklin H. Head. (2) At Wholesale, by Adolphus C. Bartlett, vice-president of Hibbard, Spencer, Bartlett & Co. (3) The Development of the Forging Industry, by H. F. J. Porter, of the Bethlehem Steel Co. (4) Modern Methods of Making Steel Forgings, by H. F. J. Porter. (5) The Credit Department of a Modern Business, by Dorr A. Kimball, credit man Marshal Field & Co. (6) The Commercial Value of Advertising, by John Lee Mahin, president Mahin Advertising Co. (7) The Textile Industries, by S. N. D. North, secretary National Association of Wool Manufacturers (three lectures).

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IV. Banking: (1) The Methods of Banking, by J. H. Eckels, president Commercial Bank of Chicago.

V. Technique of Commerce: (1) The Stock Exchange. (2) Investments, by D. R. Forgan, vice-president First National Bank, Chicago. (3) The Board of Trade, by George F. Stone, secretary Chicago Board of Trade. (4) Fire Insurance, by A. F. Dean, assistant manager, western department Springfield Fire and Marine Insurance Co. (5) Life Insurance, by Willard Merrill, vice-president Northwestern Mutual Life Insurance Co. (6) Foreign Exchange, by H. K. Brooks, manager financial department American Express Co.

GEOGRAPHIC LITERATURE

BOOK REVIEWS

Longmans' New School Atlas.—George C. Chisholm and C. H. Leete. New Edition. Longmans, Green & Co., 1901. Pls. 40. Index.

While the new edition of "Longmans' New School Atlas" retains the distinctive features which characterized its forerunner, the changes and additions have increased its usefulness, and it stands to-day, we believe, without a rival as an indispensable aid to the teaching of geography and history in English and American schools.

Two new plates, one of the Balkan Peninsula, and one of Turkey in Asia, Persia, and Egypt, with an inset map of Lower Egypt have been added, bringing the number of plates up to forty. The map of North America has also been supplied with inset maps of Hawaii and Porto Rico.

The substitution of a rainfall map of the world for the map of magnetic variation is, perhaps, the change that will be most gladly welcomed. This map, together with those showing the temperature, pressure, and winds of the world for January and July, and the vegetation and population of the world, form an excellent laboratory equipment for laying the foundations of a thorough elementary knowledge of the relation of climate to man. The value of the isothermal maps has been increased by the addition of the names of certain cities. We are glad also to note the names of the general winds on map 5, though we think the term *Prevailing Westerlies* would have given more general satisfaction than *Return Trades*.

In comparing the pressure maps with those in Bartholomew's Physical Atlas, Volume III (Meteorology), we note several discrepancies. While these do not impair the general value of the maps for elementary pupils, we believe it a mistake not to have the atlas in more perfect accord with the latest standard authority. Accuracy is as fundamental in elementary as in advanced work, and an accurate atlas of this nature would be a good object lesson for other publishers, and would place this atlas above criticism.

The thirty-two maps of continents and countries are good specimens of cartographic skill and accuracy. They are not overburdened with detail, yet there is enough to make the maps a necessary handbook to every teacher of history. There has been a slight change in the scheme of color, and in most cases a change for the better, though in the map of the United States the high plateaus are not differentiated sufficiently from the surrounding mountains. Such a region as that of the Great Basin is not as clearly visualized as if the contrast in color were greater.

That the new edition is up to date is shown on map 12 by the addition of 27 towns whose industrial products less the raw material exceed ten million dollars. Seventy-six additions have also been made to the Index.

We wish the editors had seen fit to substitute an inset map of South Africa for the maps of the gold and slave coasts. A few names have been added to the map of Africa, but there is little material furnished for the proper treatment of any but the northern part of this continent. Detailed comment concerning all the features of the atlas is, however, unnecessary.

C. W. H.

The World Almanac and Encyclopedia.—The New York World. 20x14 cm. New York, 1902. Pp. 540. Paper, 25 cents. Cloth, 50 cents.

Of all the long list of Almanacs issued by the various publishing houses, this is unquestionably the best. It is everything an almanac ought to be, with its astronomical and other data relating to the counting of time; but it is in addition, a handbook of ready reference to a very large list of topics in which organization and statistics are changing each year, and it is corrected to date of publication, January 1st, and is as accurate and trustworthy as any such compilation can be made.

Some of the topics about which we need to inquire at times, and on which this book will answer questions are: Weather Bureau storm warnings; tornado statistics; normal temperature and rainfall; postal information (very full); tables of weights and measures; passport regulations; naturalization laws; patent office laws; internal revenue statistics; civil service; qualifications for voting in various states; details of political organization, officers, elections; details of diplomatic intercourse and consular service; labor and capital organizations; foreign trade of U. S.; a tabulation of chief national and state legislation in 1901; ample information on U. S. insular possessions; cables and telegraphs of the world; statistics of navigation and railways and transportation; financial statistics of all kinds; natural resources of America and of the world at large; social statistics, crime, pauperism, marriage, wealth, social organization; record of sports of all kinds; records of learned, artistic, patriotic, fraternal and other societies; statistics of education, very complete; of religious societies; of the armed strength of nations; of reigning families, and officers of the various governments; population of states and cities; officers of the federal government, of the Army, Navy, and of the various States; election returns, National and State; ample information about the City of New York, with maps of railways and trolleys.

This book is so valuable that it ought to be on the study table of every teacher, and on the shelves of every school library. J. P. G.

The Illinois Glacial Lobe.—Frank Leverett. Being the thirty-eighth Monograph of the U. S. Geological Survey: 20x23 cm. Washington, the Government Printing Office, 1899 (1901). Pp. xxi, 817. Price $1.60.

The State of Illinois was overridden several times during the Ice Age, by ice sheets from both of the great centres of dispersal on either side of Hudson Bay, and the records of the various advances are plainly written in the phenomena of the drift. Indeed the State lies in such a position in relation to these various advances, that its glacial records once read, become, as Professor Chamberlin says in his letter of transmittal "a key to the whole glacial series east of the Mississippi." The careful, detailed description of the glaciated area of the Northern States, under the division of the Geological Survey of which Dr. Chamberlin has charge, will be reported on in special monographs, and the present report forms the first issue of the series.

The Illinois glacial lobe was an ice sheet which advanced from the regions east and south of Hudson Bay, to the axis of the Mississippi Valley, and almost to the mouth of the Ohio, and with many advances and retreats all of which are recorded in fringing terminal moraines, showing the constant influence of the trough of Lake Michigan concentrating the flow of ice at the margin of the sheet into a long tongue or lobe of ice.

The Monograph describes in detail these various advances, with beautiful maps, showing the physical features of the region, as determined by geological structure (map of formations), and as modified by glacial erosion or deposition (topographic map, and map of drift.)

The evidence is summed up, for a succession of glacial advances with mild interglacial periods, the five great stages of advance being named in order from oldest or lowest up to the latest; Albertan or sub-Aftonian, Kansan, Illinoisan, Iowan, Early Wisconsin, and Late Wisconsin. The record of each stage of advance and retreat is discussed in detail. An interesting chapter describes the fluctuating level of Lake Michigan, as recorded in beaches and outlet at Chicago. Another shows the influence of the drift on drainage systems. A chapter is given to the wells and the water supply of the State, and one to the origin and character of the soils of the region.

This is a very valuable report, and no teacher in Illinois and adjacent States can afford not to be familiar with it. It is of the highest value to teachers of physiography, and all others interested in the phenomena of the drift. J. P. G.

BOOK NOTES*

Children of the Palm Lands.—Alice E. Allen. 17x14 cm. The Educational Publishing Co., Boston, 1901. Pp. 187.

A reading book for children in the lower grades, with chapters on Banana Land, Allspice and Ginger, Tea, A Day in Coffee Land, Chocolate and Cocoa, The Land of Dates, Pepper and Nutmegs, In Java, and Where Cinnamon Grows.

Geology and Water Resources of Nez Perce County, Idaho.—Water Supply and Irrigation Papers, of the United States Geological Survey, Nos. 53 and 54, 1901.

* The Book Notes and References to current magazine articles are by the Teachers' Geography Club, of Boston, Mass.

The first of the Papers noted above is an interesting and well-illustrated account of the Geology, Physiography, and Soils of Nez Perce County, Idaho. The geological history of the region is outlined and especial attention given to the history, character, and topography of the Columbia River Lava. The second paper is devoted to the Water Supply and Economic Geology of the same region.

NEWS NOTES

COLONEL FRANCIS W. PARKER, the eminent educational leader who has done so much in promoting the cause of geography teaching in elementary schools, has just died at the age of sixty-four years.

CAPTAIN GEORGE P. AHERN, U. S. A., who is in charge of the Forestry Bureau at Manila, has compiled a work on the important woods of the Philippines. There are more than 600 tree species on the islands.

MISS ZONIA BABER, head of the Department of Geography, of the Chicago Institute, of the University of Chicago, is now travelling and studying in Cuba, with especial view to becoming better acquainted with ecological conditions in the tropics.

Meehan's Monthly for February contains an interesting account of the vegetation along the Ocklawaha River, Florida.

THE *Bulletin of the American Geographical Society* for December contains notes on American forests and forestry by A. P. Brigham. The forestry schools at Cornell, Yale and Biltmore, the president's plea for irrigation, and Dr. Fernow's recent reports on the Alaskan forests are all treated in an interesting manner.

A RECENT contribution from the National Herbarium by V. K. Chestnut gives an excellent and well-illustrated account of the plants used by the Indians of Mendocino County, California. The number of species utilized is surprising.

THE government and people of Russia are becoming increasingly interested in forest preservation, although over 450,000,000 acres of land are still forested. Wood is more extensively used for fuel and building purposes in Russia than in most countries. Circular 23 of the Bureau of Forestry contains some valuable suggestions for prospective forest students, indicating the many hardships as well as the advantages which may be found by those who make forestry a profession.

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THE announcement is made that the Clarendon Press is soon to issue an authorized translation of Schimper's *Pflanzengeographie* by Prof. Percy Groom and W. R. Fisher. Thus the greatest of all works in phytogeography is to be made accessible to English and American students.

THE following books in geography are announced for the early spring from the press of the Macmillan Company: "The Teachers' Manual of Method in Geography"; "A Discussion of the Principles and Method involved in the Tarr & McMurry Geographies," by Dr. Charles A. McMurry; "The Physical Geography of New York State," by Professor Ralph S. Tarr.